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Title: Investigation of Satellite Imagery for Regional Planning
Proposal No.: 219
Contractor: Tri-State Regional Planning Commission
100 Church Street
New York, N.Y. 10007
Principal Investigator: William Harting
Principal Investigator Number: ST-345

Progress

The attached report describes the results of visual investigation
of Black/White ERTS images at a scale of 1:1,000,000

E73-10986) INVESTIGATION OF SATELLITE
IMAGERY FOR REGIONAL PLANNING: VISUAL
INTERPRETATION OF BLACK/WHITE IMAGES AT
1:1000000 (TRI-State Regional Planning
Commission) 13 p HC \$3.00 CSCL 08B

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INVESTIGATION OF SATELLITE IMAGERY FOR REGIONAL PLANNING

Visual Interpretation

of

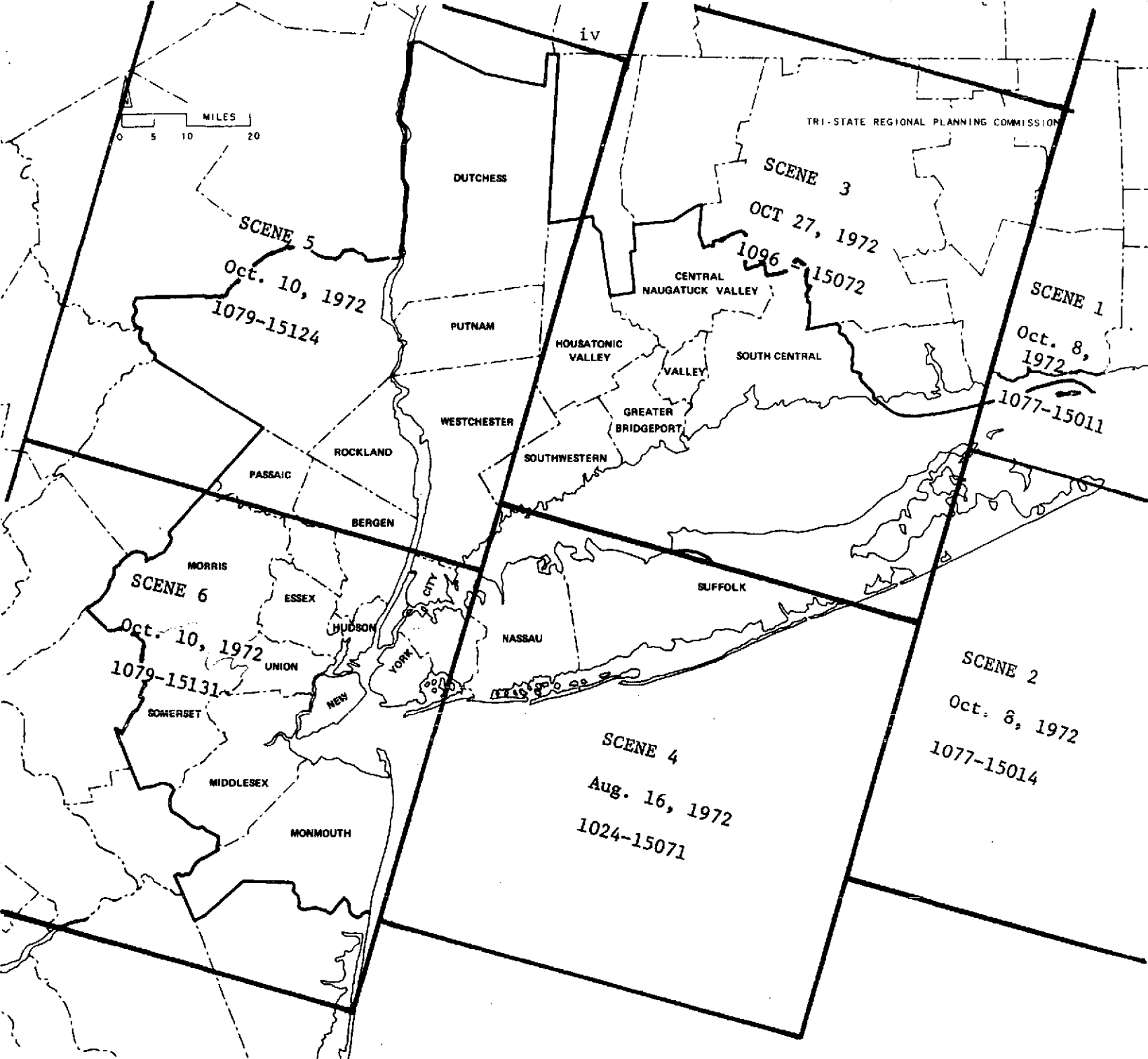
Black/White Images

at

1:1,000,000

by

William Harting



INVESTIGATION OF SATELLITE IMAGERY FOR REGIONAL PLANNING

ERTS-1 images used for

Visual Interpretation

of

Black/White Images

at

1:1,000,000

TRI-STATE REGIONAL PLANNING COMMISSION

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INVESTIGATION OF SATELLITE IMAGERY FOR REGIONAL PLANNING

VISUAL INTERPRETATION OF BLACK/WHITE IMAGES AT 1:1,000,000

INTRODUCTION

This report is part of a series which will describe the results of investigations of ERTS imagery at various scales using color and black/white photos and incorporate both visual and electronic interpretation. This particular report describes the result of images of four MSS (Multispectral Scanner Subsystem) bands (4, 5, 6, 7), at a scale of 1:1,000,000, taken on August 16, October 8 and October 10, 1972. These images were used to obtain cloud-free prints of the study area.

It should be clearly understood that the land use definitions and the visual observations are specifically oriented toward regional planning use.

METHOD

The approach used was to 1) ascertain whether a unique "signature" could be observed or 2) to determine if an acceptable inference in lieu of a signature could be drawn. The 70 mm. negatives of each band were enlarged on a D type Omega enlarger. Each land use category was outlined on an overlay to the photo in various parts of the Region. The outlined area was compared to the land use data files maintained by the Tri-State Regional Planning Commission. Aerial photos at two scales (1:4800 and 1:24,000) were also used as reference.

CONCLUSIONS

The following general conclusions have been reached:

The black/white 1:1,000,000 scale can be used for observing general land development patterns but is not suitable for visually delineating the five specified regional planning land use categories.

General, but not unique, signatures were observed.

Acceptable inferences of land uses could not be consistently used.

It is expected that a larger scale would make the various features more visible.

It is hoped that electronically recorded and scanned images will increase the ability to obtain a unique land use "signature".

MSS band 4 has a "muddy" appearance which makes the various land uses blend together.

MSS band 5 provides the best overall image for land use purposes.

MSS band 6 accentuates the water bodies and the very intensely developed areas.

MSS band 7 in addition to accentuating the water bodies and the intensely developed land also makes certain roads highly visible.

FINDINGS

It was expected that gross observations of land developed patterns could be made for graphic presentation but would not serve as a suitable source for specifically delineating land uses as an input toward monitoring change or growth. The result of the investigation of the five specific land uses are given in the following pages.

VACANT LAND

Vacant land, for regional planning purposes at Tri-State, is defined as those areas which are susceptible for development. Land which does not contain structures or streets would be the prime requirement. Included in this definition is land which has a natural ground cover, wooded, or is used as agricultural land. Within the agricultural category that portion of a farm that contains buildings is considered developed and the rest is classified vacant.

Land in between partially developed areas is also defined as being vacant. This is a common condition in suburban areas and is critical for planning purposes.

Excluded from the Vacant category are parks and water shed land. The property lines cannot be differentiated from vacant land on photos and so must be delineated separately using other source data.

Finding

Vacant Land comprised of heavily wooded areas can be delineated for areas of 40 acres or larger on MSS bands 4 and 5.

Agricultural areas (defined as vacant) cannot be discerned from partially developed land. Various shades of grey at first appear to yield a discernible difference between developed and vacant. Detailed examination reveals that the same color density on different parts of the photo and in other parts of the Region have different land use characteristics. Consistent determination is not possible.

Prior knowledge is necessary to identify the specific land use pattern.

Vacant land is not observable on MSS bands 6 and 7.

SUMMARY STATEMENT

Black/White ERTS images at a scale of 1:1,000,000 is not suitable for determining vacant land for regional planning purposes. Other scales will be investigated.

DEVELOPED LAND

For regional planning purposes the term "developed land" is defined as that area on which structures and streets have been built. Included in the definition is open land - adjacent to and associated with the existing structures - which would not be subject to additional buildings, ie, the balance of a residential lot not occupied by the house. Developed land has been classified into 4 categories.

- sparsely developed - rural
- moderately developed - newer suburbs
- well developed - older suburbs
- intensely developed - urban

Finding

Developed land can be detected in varying degrees of success on all four MSS bands 4, 5, 6, 7. However, prior knowledge of whether the area is developed or not is necessary.

Only large areas of developed land can be observed on MSS band 4. The other three land development patterns cannot be delineated with accuracy.

On MSS band 5 the sparsely developed land can be distinguished from the intensely developed land. However it is not possible to separate the 4 classes of development uniquely from one another with sufficient accuracy.

On MSS band 6 only areas of very intense development can be observed. These would be the Central Business Districts (CBD) of

towns which are relatively small in size and have over 12,000 population. All other categories of development cannot be observed.

MSS band 7 has the same basic characteristics as band 6 but the very intense areas are more clearly defined and strip development can be detected.

SUMMARY STATEMENT

Developed land can be distinguished from undeveloped land in broad density ranges. The 4 classes of development cannot be uniquely separated for planning purposes.

RESIDENTIAL DEVELOPMENT

Residential development is important to the planning process since it defines people characteristics - where they live, income, auto availability, etc. The density of residential land has an important bearing on the type of services (roads, mass transit, water and sewer facilities, etc.) that are required.

Finding

Residential development could not be distinguished from other types of development. Prior knowledge of the area could be used to draw logical assumptions about the type of development. Multifamily housing (garden apartments) could not be observed as being different from single family housing areas or even from nonresidential land use. Areas where garden apartments were known to exist were investigated but could not be detected.

If the observed development is assumed to be predominantly residential then density differences between sparsely and intensely developed areas can be seen.

SUMMARY STATEMENT

Residential development cannot be sufficiently distinguished from other types of development for planning purposes.

NONRESIDENTIAL DEVELOPMENT

The primary characteristics of nonresidential land is that they are work sites. As such they are the designated end of journey-to-work trips and have goods movement and employment implications.

Finding

As in the case of residential land they do not have a unique signature which would visually set them apart from other types of developed land. However it is known from existing inventories that this type of development tends to cluster. If this knowledge was employed then some of the intensely developed areas could be designated as predominantly nonresidential.

SUMMARY STATEMENT

Nonresidential development cannot be sufficiently distinguished from other types of development for planning purposes.

STREETS

Streets are broken down into three categories for use in planning - limited access, arterial and local. For regional purposes the limited access highways and major arterials are of primary importance. Local streets are considered part of other types of developed land.

Finding

The most discernible streets are the limited access highways and major arterials in rural areas. Local streets blend in with other forms of development and with agricultural land. Most streets cannot be delineated in densely settled areas. In the cases where they can be observed it is because they are wide and relatively new. In some cases the arterial routes are more visible than the wider limited access highways.

SUMMARY STATEMENT

75% of the limited access highways and major arterials can be observed.